

Shigella Infections

Observations on Recognition and Management

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DIARRHEA is one of the most common complaints in pediatric practice. There are, etiologically, many kinds, among them metabolic diarrhea, parenteral diarrhea, the nonspecific epidemic diarrhea and vomiting generally thought to be due to a viral infection, and, finally, enteric infections due to specific organisms and parasites such as *Shigella*, *Salmonella* and *Endameba*.

Shigella infections typically are characterized by a sudden onset of high fever, explosive diarrhea with liquid foul-smelling stools containing blood, pus and mucus, and pronounced prostration and irritability. Meningismus is also a common feature. Fever and symptoms of toxicity frequently precede the onset of liquid stools by several hours. Abdominal cramps and tenesmus, which are the most common symptoms in adults, are less frequently noted in children. Prostration is usually out of proportion to the amount of diarrhea and degree of dehydration. Multiple cases in a family should arouse suspicion of a specific enteric infection.

A very useful adjunct in diagnosis is examination of the liquid stool under the microscope. The presence of large numbers of erythrocytes and leukocytes is suggestive of *Shigella* infection. Definitive diagnosis is made by cultures of the liquid stool or by culture of material swabbed from the rectal mucosa. Explosive diarrhea and acute illness do not occur in all cases of *Shigella* enteritis. In a small number the symptoms are milder. It was noted by the author that recurrence or reinfection was less often accompanied by severe toxicity and high fever than the initial infection. Routine cultures of specimens taken from persons in the same household as a patient are likely to reveal a number of carriers of the organism.

Shigella dysentery is generally considered to be an epidemic disease, particularly likely to occur during war or famine and in crowded institutions and orphanages. However, in addition it is often found to occur endemically in the more crowded areas and to infect family groups. Felsen^{2, 3} recently stressed the high incidence of *Shigella* infections. An impres-

• In review of 117 cases of Shigella enteritis observed in the isolation division of the San Francisco Hospital, it was noted that the most common symptoms were high fever, liquid and bloody stools, prostration, irritability and meningismus. The use of antibiotics did not significantly affect the course of the acute illness but resulted in earlier elimination of the Shigella organisms from the bowel. "Carriers" were found to be particularly resistant to antibiotic therapy.

The disease is self-limited. In 30 cases the patients recovered with only symptomatic treatment. Management of fluid and electrolyte balance was often an important factor in supportive therapy.

sive number of cases have been observed in recent years in the emergency room and the out-patient clinic of the San Francisco Hospital.

Although the diagnosis can readily be made clinically, the proof rests with the demonstration of the organism on stool culture. Thus, the reported incidence of the disease depends to a very great degree on how many cultures are taken. In the author's experience the reported incidence always rose considerably when the house staff's index of suspicion was high.

For the 12 months ended June 30, 1950, 1,005 cases of *Shigella* dysentery were reported in California, with 24 deaths. This compared with 413 cases of *Salmonella* infection and 325 cases of amebiasis for the same period. In the 12 months to June 30, 1951, 585 cases of *Shigella* dysentery were reported, with 14 deaths; and in the same period there were 476 cases of *Salmonella* infection and 377 cases of amebiasis.

There is little doubt that the true incidence of *Shigella* enteritis is considerably higher. In some instances the diagnosis is not suspected; more frequently, although it is suspected and the patient treated, no cultures are taken and the diagnosis is not made definitively. Since this is a communicable disease, particularly within family units, it is important that it be diagnosed and managed in such a way as to minimize the spread of pathogens within the family unit and within the community.

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TABLE 1.—Symptoms of 95 acute cases at the time of admission to hospital

	No. of Cases	Per Cent
Fever over 100° F. rectally.....	88	84
Fever over 104° F. rectally.....	40	38
Liquid stool	91	86
Bloody stool	44	42
Pronounced lethargy	46	44
Pronounced irritability	23	22
Meningismus	28	27
Moderate to severe dehydration.....	57	54

The purpose of this presentation is to call attention to the considerable incidence of *Shigella* enteritis in endemic form, and to make several observations concerning recognition and management. To this end, the records of the isolation ward of San Francisco Hospital between August 1950 and August 1953 were reviewed.

REVIEW OF CASES

One hundred seventeen patients with *Shigella* enteritis were admitted during the three years. Ninety-five of them were acutely ill and 22 were carriers. Seventy-eight of the cases were caused by *Shigella sonnei*, 23 by *Shigella* of the Flexner type, and 17 by other *Shigella* organisms, among which were *Shigella alcalescens*, *Shigella dispar* and *Shigella boydii*. It is interesting that not a single case of *Shigella dysenteriae* was encountered. There was no statistical relationship between the kind of organism and the severity of disease. Only four of the 117 patients were adults, two of whom were student nurses who were exposed to infection on the ward. Of the 113 children, 95 were between the ages of one and five years; seven were between three months and one year; the rest were between five and 15 years. A factor in this age distribution probably was that the criteria used for hospital admission were severe diarrhea with dehydration, or the presence of severe toxicity. Dehydration tended to be more pronounced in the younger age group. Many additional patients observed in the emergency room and out-patient clinic were thought, on the basis of clinical symptoms, to have *Shigella* infection but were considered not sick enough to require hospitalization.

Symptoms in the 95 acute cases at the time the patient was admitted are listed in Table 1. Fever, liquid and bloody stools, pronounced lethargy and irritability were the most common. Meningismus was present in 26 per cent of the cases and in half it was so pronounced that lumbar puncture was done upon admission. The number of stools per day was quite variable and, in the author's opinion, the most unreliable feature in the history. There was very little correlation between the number of stools (as reported by the mother) and the presence of

severe dehydration. There was one death in the series: a severely dehydrated child died 20 minutes after admission.

Many different kinds of therapeutic regimen were used. The records were reviewed to determine any differences in the clinical response to the variety of therapeutic agents. The selection of the antibiotic or sulfa drugs to be used for any particular patient was at the discretion of the resident on the ward.

One group of 30 cases in which only symptomatic therapy was given was composed of cases where a decision was made at the time of admission to use no therapy until the organism was identified by the laboratory. Then, when a report on the culture was made two to three days later, the patient was sufficiently improved in most instances and was continued on symptomatic therapy only.

The distribution of the severely ill and mildly ill children, as well as Flexner and sonnei type of *Shigella*, were generally comparable in the different treatment groups. Drugs were started on the first to fourth day of the disease and were continued for six to seven days, and as long as ten days in some instances. Terramycin and chloramphenicol were used in a dose of 50 to 60 mg. per kilogram of body weight, given orally; neomycin 1.5 to 2.5 gm. daily, by mouth; sulfadiazine 125 mg. per kilogram of body weight, by mouth; polymyxin 200 to 300 mg. daily, by mouth; aureomycin 35 mg. per kilogram of body weight, by mouth.

The kinds of treatment and the results are summarized in Table 2. "Duration of positive stools" as shown in the table was the length of time from admission until the first culture negative for *Shigella* was obtained. In this regard it should be noted that in most cases stools were not examined bacteriologically while treatment was being given. Examinations were resumed on the last day of therapy. This accounts for the fact that none of the periods was less than a week. Duration of hospital stay was determined by the City of San Francisco requirement that three negative stool cultures be obtained before discharge of the patient from the hospital.

The results as shown in Table 2 bring out the fact that *Shigella* enteritis is a self-limited disease. Thirty patients recovered satisfactorily with symptomatic therapy only. It was interesting that the clinical course as measured by the duration of fever and of diarrhea was not influenced by the administration of any one of the antibiotics. However, the length of time during which the stools remained positive was definitely cut down by the use of broad spectrum antibiotics and sulfadiazine. This shortened the hospital stay of the patient, as indicated.

Neomycin was tried on 13 patients and, as is clearly brought out in the accompanying table, a good many bacteriological failures were encountered. It did not exert any significant influence on

TABLE 2.—Results of treatment of acute *Shigella enteritis* in 95 acute cases

Treatment	Number of Patients	*Failure of Treatment	†Fever	‡Duration of Abnormal Stools	(in days) of Positive Stools	of Hospital Stay (days)
Symptomatic only	30	0	2.2	4.0	13.0	21.6
Terramycin (acute cases; treatment started first or second day)	27	1	2.1	3.6	9.3	15.7
Terramycin (treatment started between twelfth and fortieth day)	5	1	2.0	3.4	32.6	40.0
Neomycin	13	4	1.9	8.6	19.0	22.4
Sulfadiazine	8	2	2.3	4.0	10.0	16.0
Chloramphenicol	6	0	2.0	5.0	8.0	13.0
Polymyxin	2	1	2.0	3.5	11.0	18.0
Aureomycin	2	0	2.0	2.0	6.0	16.0
Aureomycin and sulfadiazine.....	2	0	1.5	6.0	13.0	18.0

*These are cases in which culture of stools was positive for *Shigella* after a seven-day course of treatment.

†Rectal temperature above 100° F.

‡Liquid and bloody and containing large amounts of pus and mucus.

the course of the disease, and its use was discontinued for that reason.

In the 22 carriers (not included in Table 2) the disease was more resistant to therapy than it was in the acute cases. Eight of these 22 carriers were treated with multiple courses of drugs; four of them were treated with terramycin and the stools remained positive for *Shigella*. They were retreated with a combination of terramycin and polymyxin for one week. Three of the four then had negative cultures and one continued positive but finally became negative after treatment with chloramphenicol for one week. The hospital stay in the latter case was 39 days. Another carrier continued having stool cultures positive for *Shigella* after treatment with aureomycin and sulfadiazine. A subsequent week of therapy with terramycin, followed by one week's course of aureomycin did not rid the stool of *Shigella*. The stool finally became negative for the organism after a course of terramycin and polymyxin. The hospital stay was 56 days in this case.

MANAGEMENT

The use of sulfonamides and different antibiotics in treatment of *Shigella* infections has received a great deal of attention in the past few years. Cheever¹ reviewed the use of antibiotics up to 1952. Garfinkel⁴ described experience with the management of 1,400 Korean prisoners. The addition of sulfonamides at first and, more recently, of the broad spectrum antibiotics has been an important adjunct in the management of *Shigella enteritis*. Lieberman and Jawetz⁵ expressed the opinion that polymyxin is particularly useful in the treatment of the carrier state.

It is important in dealing with pediatric cases, however, that, besides the use of specific antibiotic therapy, the broad general principles of management of diarrhea in children and infants be kept in mind. Often children with the disease are severely dehydrated and acidotic. Intravenous administration of a hypotonic balanced electrolyte solution to replace lost fluid and electrolytes in acute cases is

an essential aspect of management. Shock, if present, has to be treated by infusion of blood or plasma. For severely toxic, semicomatose children the use of oxygen is an addition to general supportive therapy. Children usually are anorexic during the acute phase of the illness, and only clear fluids are given. As the diarrhea and general well-being improves, a soft low-residue diet can be started to protect the inflamed bowel.

For many years soluble sulfonamides (particularly sulfadiazine) were considered the drugs of choice in the management of *Shigella* infections. Their usefulness is limited by two factors: (1) the recent observations of increasing numbers of strains of both *Shigella sonnei* and *Shigella Flexner* which are resistant to sulfonamides, and (b) the undesirability of giving sulfonamide to a dehydrated child because of the danger of crystalluria and hematuria. Terramycin, aureomycin and chloramphenicol are thought by many observers^{2, 4} to be the drugs of choice for *Shigella enteritis*. The author's experience is too small to warrant any conclusions as to the preference of one antibiotic over another. Neomycin was found to be of very little value in the treatment of acute cases or carriers. Lieberman and Jawetz⁵ found carriers to be resistant to any antibiotic therapy. Among the carrier cases in the present study also there was a significant number of failures of treatment with every antibiotic.

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